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FOREST INSECT INVESTIGATIONS

THE ROLE OF FOREST INSECTS IN RESPECT TO TIMBER DAMAGE IN THE SMELTER FUME AREA NEAR NORTHPORT, WASHINGTON

1931

by
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INTRODUCTION

In July, 1929, the assistance of the Bureau of Entomology was requested by the Smelter Fumes Committee of the Department of Agriculture in order to secure information relative to the role that forest insects were playing in the death of timber within areas adjacent to Northport, Washington. In concurrence with this request, Mr. F. P. Keen made an examination of the area, and early in August submitted a report covering the results of his investigations. In November, 1929, the Bureau of Entomology was again requested to assign Messrs. Keen and Evenden to this problem for the purpose of securing additional data. A rather detailed report covering the results of this subsequent investigation was submitted under date of December 11, 1929. Though this report was in more detail and contained considerable quantative plot data, there were no substantial changes from the information previously submitted by Mr. Keen. No further investigations were conducted by the Bureau of Entomology until September, 1931, when the Smelter Fumes Committee again requested the detail of Mr. Evenden to this area, to determine if any changes had occurred in the status of forest insects as previously reported. Following this assignment, the writer spent the week of September 21 to September 26 in making an extensive examination of the region, the results being presented in this report.

GENERAL CONDITIONS OF NORTHPORT AREA

In the report submitted under date of December 11, 1929, the general conditions of the areas examined were discussed in some detail. It was brought out in that report that there were a number of complexing, intangible factors, such as weather conditions, timber cutting, insects, disease, and reported smelter fumes, etc., which were all contributing to the general decadent condition of the timber stands within the Northport area. These factors are again mentioned at this time in order to stress the difficulty which is encountered when an attempt is made to determine the part which insects are playing in the death of the trees within this area. Such a determination is a relatively easy one to make when newly infested trees are encountered, as one can then see the physical condition of the host at the time of the insect attack. On the other hand, with trees that have been dead for one or more years, and are in an area where it is known that other destructive factors are operating, it is extremely difficult to give an accurate decision as to the primary importance of the insect attack. This difficulty, as can be seen, lies in the fact that it is impossible to visualize tbe actual physical condition of the trees at the time they were attacked by insects. Though the barkbeetles working in this area are considered as being primary insects and capable of attacking and destroying healthy mature trees, they do prefer and select weakened and decadent host material whenever available. Therefore, though the work of destructive insects can be found associated with many dead trees within this area, they are not always the primary agency responsible.

ZONES OF TIMBER DESTRUCTION

In 1929, Messrs. Keen and Evenden in their investigation established two zones of timber damage within the area reputed to be damaged by smelter fumes as being clearly recognizable. Based upon his recent examination the writer can see no reason for effecting any changes in these two zones, though there are some slight differences to be recorded in the status of insect conditions throughout the region.

ZONE 1

The following description of this area has been taken from the report submitted by Keen and Evenden December, 1929:

1929

"This is a zone of fairly heavy timber damage extending along the Columbia River gorge from the International Boundary to a point about six miles below Northport. In this area the timber stand has been rather badly depleted through logging, forest fires, and what was assumed to be smelter fumes, so that only small patches of living trees could be found. On most of the yellow pine and Douglas fir trees only very scanty foliage is present, usually consisting of only one year's growth of needles. The Douglas firs are dying back from the top and inwardly from the tips of the lateral branches. All of the trees are of an unhealthy color and show every evidence of being in a very sickly or decadent condition. This condition of the foliage was not due to insect defoliation but some abnormal condition, presumably smelter fumes. In this zone the loss of timber has been rather heavy. Insects may have contributed somewhat to this destruction, but it is believed only in a minor way."

The trees in this area are apparently in a healthier condition than recorded in 1929, as in many cases there are from two to three years' growth of foliage present and it is of a fairly healthy color. This means that on many trees one can find 1929, 1930, and 1931 foliage. On a large per cent of the trees there is 1930 and 1931 foliage, while only a few trees show 1931 needles only. The writer has no information which might be used in explaining this apparent recovery of the trees from the condition observed in 1929. Such thoughts as the recovery from previous fires, increased rainfall, reduction in the reported smelter fumes, etc., might be offered as solutions.

Throughout the eastern portion of the State of Washington, northern Idaho, and northwestern Montana, during the past season there has been an increase in the losses in yellow pine from the attacks of the western pine beetle (Dendroctonus brevicomis Lec.). This same condition is reflected throughout the smelter fume area, and in Zone 1 there has been a very marked increase in the number of yellow pine trees attacked by these insects. This occurrence is as foreseen, for in an area where the timber stands were in such a decadent condition, as observed in 1929, it could be expected that a large per cent of the remaining trees would be destroyed by bark beetles within a few years. The apparent recovery of many trees from the decadent condition as previously existed made the task of determining the part which insects played in the death of the trees even more difficult than during previous examinations. Many trees appear to have been near normal at the time of attack. Others are dead, with no signs of destructive insects, or else were in such a decadent condition at the time of attack that the insects were clearly

secondary in character. However, the knowledge of previous existing conditions within this zone, and the fact that the timber destruction is heavier than in other areas, would seem to indicate that the trees are more favorable host material for the beetles as a result of lowered resistance due to agencies other than insects. Therefore, in considering the existing conditions within this zone there would seem to be no need to change the previous report, which in substance was to the effect that though insects were playing a part in the destruction of the trees within this area it must be considered as being of minor importance.

ZONE 2

The following description of this area has been taken from the report submitted by Keen and Evenden, December, 1929:

1929

"This is a zone of medium timber damage, with somewhat more timber dying than in adjacent outside areas. It borders the zone of heavy damage in the northern part of the area and follows along the Columbia River gorge to Marcus, but does not extend very far back into any of the side tributaries of the river. Throughout this zone the Douglas fir and yellow pine trees show some defoliation with, for the most part, only one or two years of needle growth remaining. The foliage was often discolored. Insects were not responsible for this defoliation or for the discoloration. Dead and dying trees were less abundant than in Zone 1 but much more prevalent than in areas outside these zones of damage. Primary insects were found to be attacking and apparently killing more trees in this region than in Zone 1. In this zone one large group of lodgepole and one large patch of yellow

pine showed primary attacks of Ips. (Sample Plots #7 and 12). There were also many other dying and dead trees showing no insect attack whatever which were apparently dying from other causes."

1931

As in Zone 1, the condition of the timber stands within this area has improved to such an extent that nearly all trees seem to have a full complement of foliage. Regardless of this fact, there has been a decided increase in the volume of yellow pine being attacked by bark beetles. This loss, however, is not as heavy as that which is taking place in Zone 1, but is noticeably heavier than in the areas outside of and adjacent to Zone 2. With a large per cent of the trees within this zone that were attacked by barkbeetles during the 1931 season, the insects were considered as being responsible for the destruction . Such trees show a full complement of dead foliage still remaining, and there is no reason to feel that they were in a more decadent condition at the time of attack than the unattacked one adjacent.

However, as during previous examinations of this area, trees were again encountered that had been killed during the past year where insects were considered as being secondary to some other agency responsible for their death. From this fact it is evident that though a rather large per cent of the trees killed in 1931 showed insects as being primarily responsible for their death, there are other active factors present in the area which are detrimental and destructive to tree growth. From the knowledge that in 1929 the timber stands were in a decadent condition it can be assumed that the trees are still in a somewhat weakened condition and

consequently less resistant to insect attack. Such an assumption would explain the greater loss of timber in this area than in the regions adjacent, where in 1929 the timber stands were in a healthy, normal condition. One would rightfully consider this region as being the stepping stone, or transition between the abnormal conditions existing in Zone 1 and the normal conditions found throughout the region adjacent to Zone 2. Though perhaps there are no changes necessary in the report as given by Keen and Evenden for Zone 2, the conditions as recorded at that time are now more evident. There has been an increase of 15-25% in the number of trees killed in 1931 over loss of 1929, with a substantial increase in the degree of insect responsibility.

OUTSIDE ZONE

Description of this area and general conditions copied from report submitted by Keen and Evenden, December, 1929:

1929

"Outside the first and second zone of insect damage was an area in which dying and dead trees were very difficult to find, but those which were located showed the usual percentage of insect attacks that one could expect to find in any similar forested area. Foliage conditions were apparently normal, with from 3 to 5 years of needle growth on both the yellow pines and Douglas firs.

"Douglas firs in places were apparently being killed by the honey fungus (Armillaria mellea). Some trees were found with no insect work whatever, but with the root collar swollen and completely killed by what was

determined as the honey fungus. In other places the Douglas fir bark beetle (Dendroctonus pseudotsugae) and the Douglas fir flatheaded borer (Melanophila drummondi) were killing isolated individuals and groups of apparently healthy trees. At the higher elevations large areas of mature Douglas fir have been severely defoliated by the Douglas fir tussock moth (Hemerocampa pseudotsuga Mcd) and many of the trees within these areas will die. The areas showing defoliation by the tussock moth, which are known to the writers, are shown on the attached map. In no known cases did the defoliation extend down into the zones of damage as shown on the map.

"Yellow pine in the outside zone showed some death from western pine beetle and a few spots where large groups had been killed by the engraver beetles, Ips integer and Ips oregoni, but the death of trees was much less per unit area than in the zones of damage, and no more than would normally be expected to occur in practically all yellow pine stands."

1931

Greater changes in timber losses and insect outbreaks have occurred in the areas outside of and adjacent to Zone 2 than within the so called smelter fumes zone. These losses are all self-explanable, and no confusion exists as to the agency responsible for the destruction.

The increase in the activity of the western pine beetle and Oregon engraver beetle (Ips oregoni) which exists throughout this general region is clearly reflected in this zone. Though a serious epidemic does not exist, there are numerous single trees and small groups attacked by the western pine beetle, and small patches of reproduction being killed by Ips oregoni. This condition extends southward through the Colville valley and

is not confined to any one local area.

The greatest change that has occurred from conditions as reported in 1929 is present in the Douglas fir stands. The scattered outbreaks of the Douglas fir tussock moth (Hemerocampa pseudotsuga McD) which were first reported from this region in 1929, died down very completely in 1930, due to the activity of certain egg and larval parasites. During the writer's recent examination of these defoliated areas, no evidence of 1931 activity on the part of the tussock moth could be found. Though these insects now cease to exist in epidemic form, the three years' defoliation, which was most severe during the second year (1929), resulted in the destruction of large areas of healthy, mature Douglas fir. There can be no question as to the attacks of these moths being primary in character, and fully responsible for the death of the trees. To further enlarge upon the seriousness of these defoliating outbreaks, the Douglas fir beetle (Dendroctonus pseudotsugae) has for the past season been working in these areas of weakened and dying trees, and has already attacked many individuals that would otherwise have recovered from the defoliation. These weakened trees have contributed toward a rapid increase of these beetles, and it is very evident that a serious outbreak is pending. Though this beetle is considered as a primary killer of healthy, mature trees, it does prefer material weakened through insect defoliation, fire, or other injury, and outbreaks seem to inevitably follow epidemics of defoliating insects in Douglas fir, resulting in even greater losses than that caused by the defoliator. To attempt to foresee the extent of the timber destruction which will occur from the attacks of these beetles now developing within the defoliated trees is rather impossible. However, it is

safe to assume that as soon as more favorable host material is exhausted, a condition which practically exists at this time, the attacks will spread to the uninjured trees adjacent, and that a serious loss of timber will follow.

That this insect is capable of destroying healthy, mature trees is evidenced by the rather severe outbreak which is present at Deep Lake, T. 39 N., R. 41 E., which is several miles away from the so called smelter zone. This outbreak has developed from a small spot of trees in 1929 to an epidemic of several hundred trees at this time. This destruction is occurring within an area where the writer was unable to find any evidence of tussock moth defoliation, and the timber stands are in an apparently healthy condition. There are further outbreaks of this insect in western Montana, northern Idaho, and eastern Washington.

SUMMARY

In brief, there is no necessity for any marked changes in the data as submitted by Keen and Evenden in 1929, other than in the outside areas, where serious outbreaks of the Douglas fir beetle are pending. In Zones 1 and 2, there has been a rather marked increase in the number of insect attacked trees. This is a condition that was expected, for with forests weakened through other factors, barkbeetles are bound to find such trees to be attractive host material. There is no doubt but that insects are playing a part in the destruction of timber within the so called smelter fumes area. In Zone 1 this role is of minor importance, though during the past season it is perhaps true that many weakened and decadent trees were attacked by beetles that might have otherwise recovered from their previous injury. This thought

is based upon the apparent recovery that many trees have made from the decadent condition as reported in 1929, and under an assumption that there will be no recurrence of this condition. Even though such attacks are occurring, the insects can not be considered as being of major importance, and until a normal condition is once more established within the area the responsibility must rest upon the agency causing the decadent condition of the forest.

In Zone 2, the part which insects are playing in the destruction of the timber is of more importance. Barkbeetles have been responsible for the death of a very large per cent of the trees killed during the past season. It is true that in 1929 these timber stands were not in a healthy condition, but during the past two seasons the trees have made a very marked recovery, if foliage condition can be considered a criterion. At this time, the timber stands appear to be in a fairly healthy condition, and though it is true that the barkbeetle attacked trees are still suffering somewhat from the previous injury the death of such trees must be attributed to the insects. It is true, however, that due to the decadent condition of the forest as existing in 1929, increased number of destructive barkbeetles undoubtedly developed within the area, which, regardless of the recovery of the trees, would still leave the forest in an abnormal condition, and to a certain degree place the responsibility upon the original injury caused by agencies other than insects.

In the Outside Zone all of the timber destruction is directly chargeable to the attacks of various insects, to the same extent that insects would be responsible with any normal forest, regardless of its location.

CONCLUSIONS

In the preparation of this report the writer has tried to be as brief as possible, including only such data as deemed necessary to depict to the Committee the condition which exists within the region at this time. It is possible that there are items within this report requiring further, or more detailed explanation, or other information, description, etc., may be desired. The writer will be more than pleased to furnish any additional information possible that may be desired.

Respectfully submitted,

James C. Evenden
Entomologist

R.38E. R.39E. R.40E R.41E.

118 50' 40'

CANADA

Sophia Mtn

TM

TM

TM

TM

TM

TM

Marble

Williams

Mt O Toole

DL O Toole

Phakan L

Granite Mtn

Bossburg

Evans

Marcus

Northport

Cummings Cr.

Deep Lake

Currant Cr.

Meyers Falls

Ward

Kettle Falls

Colville River

COLUMBIA

T.37N.

T.36N.

R.39E

R.41E.

SMELTER FUME DAMAGE AREA
NEAR NORTHPORT, WASHINGTON

LEGEND

ZONE 1

ZONE 2

OUTSIDE ZONE

TM Known Areas of Tussock Moth Damage

(5) Numbers Refer to Examination Plots, 1929

COLVILLE NATIONAL FOREST
WASHINGTON